

# FIN 285 PROJECT PRESENTATION

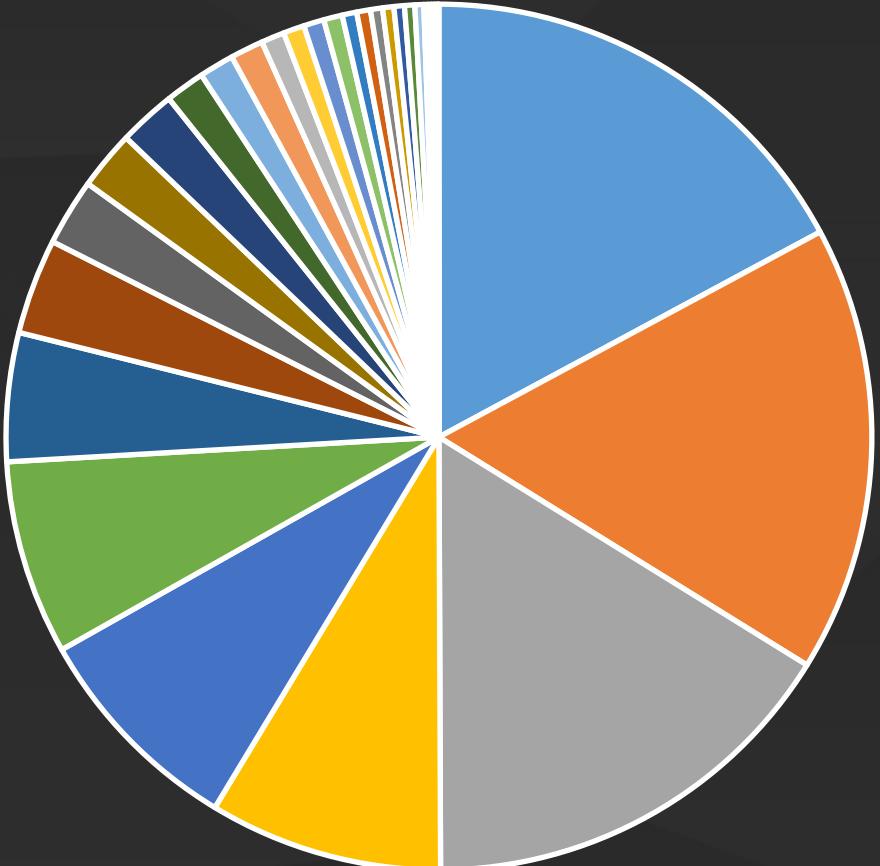
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TAIYI XIANG, QIANSHEN CHEN

DATE: Apr. 12. 2019



# ETF CONSTRUCTION

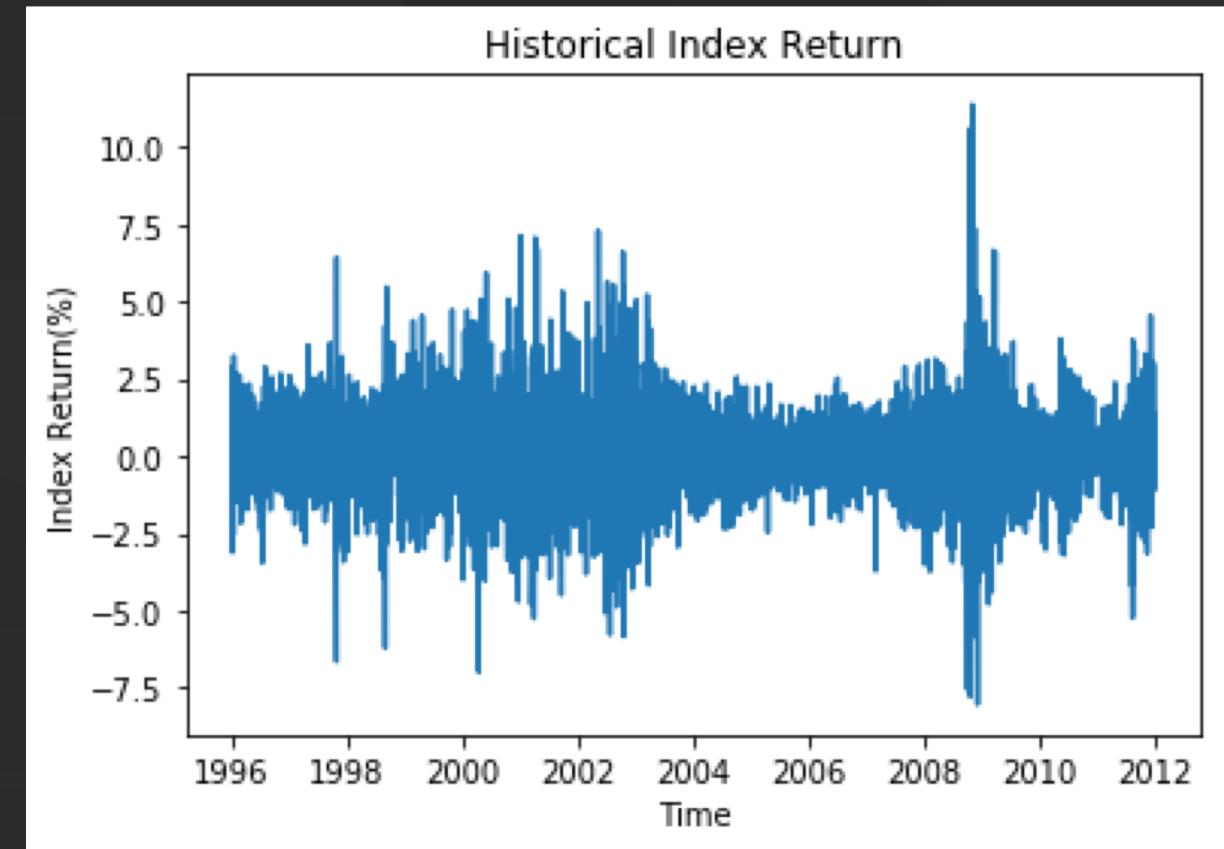
- INDEX INTRODUCTION
- INVESTMENT NEEDS & HORIZON
- ETF CONSTRUCTION
- INVESTMENT STRATEGY



## Background:

- Asset management company
- Have constructed Index in AI sector
- Time: 2012.1.1

# Index Performance



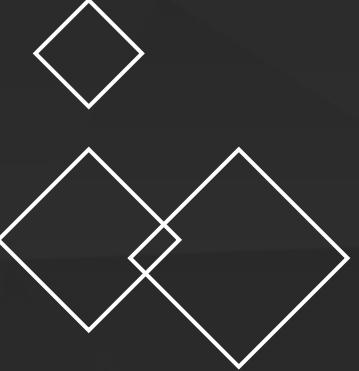
# Client Requirements & Actions

## Client Needs

1. Investment area: AI
2. Minimize the stock number in ETF
3. Minimize tracking error to benchmark
4. Investment period:  
2012.1.1 – 2018.12.31
5. Minimize transaction fee

## Actions

1. Provide constructed Index based on our prior analysis
2. Find the optimized stock number in Index to construct ETF
3. Adjust stock weight in ETF periodically

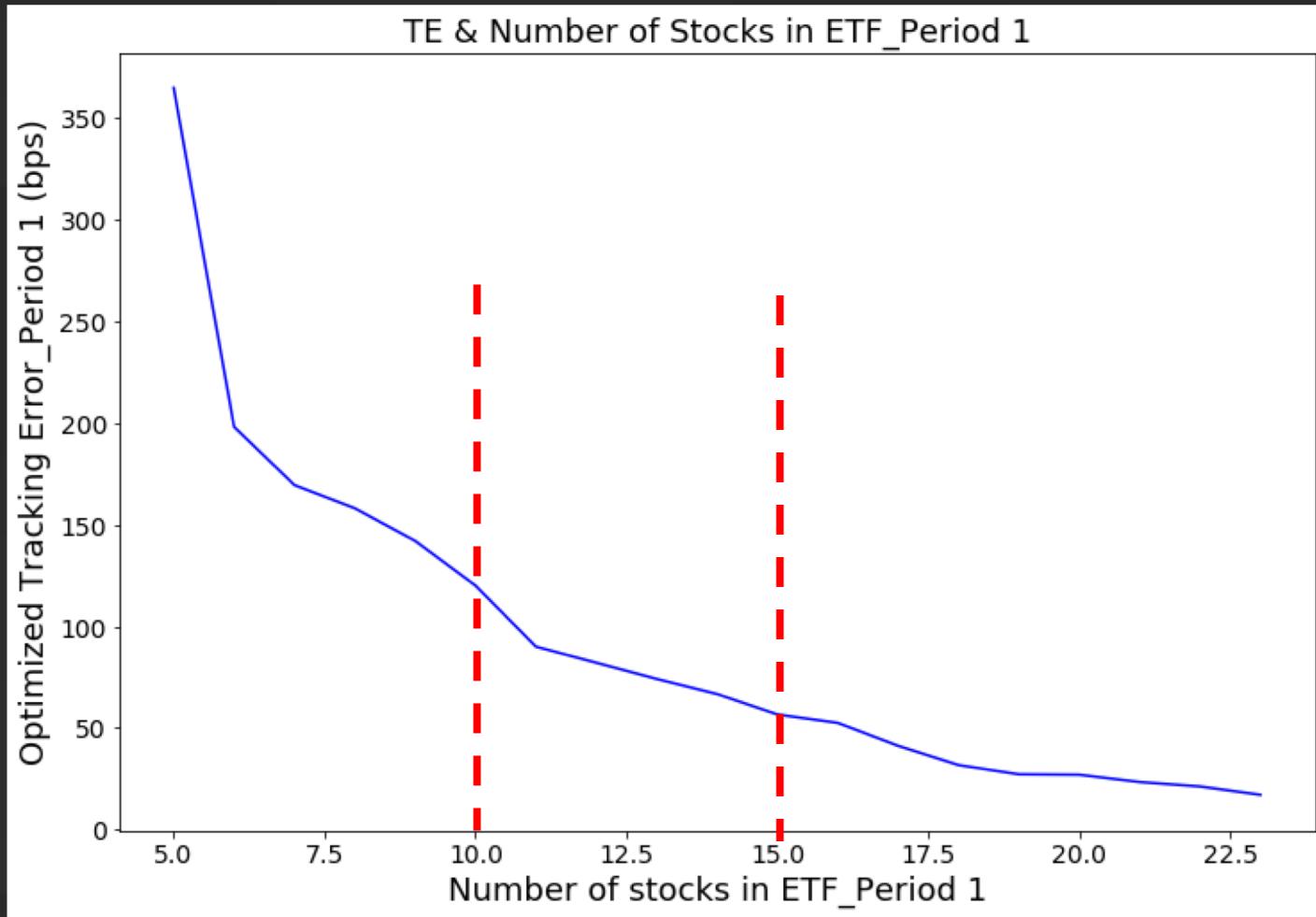


# Investment Timeline

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- **Period 1:** 1996.1.1 - 2011.12.31
    - Training: 1996.1.1-2006.1.1
    - Test: 2006.1.2-2011.12.31
  - **Period 2:** 1996.1.1– 2018.12.31
    - Training: 1996.1.1 – 2011.12.31
    - Investment: 2012.1.1 – 2018.12.31
  - Period 1 is used to find out the best investment strategy for period 2
- 

# ETF Construction



- Sort Index stock based on market Cap
- Calculate optimized TE by adding more stocks into top 5 weighted stocks ETF
- Find stocks from number 10 to 15 to be added in ETF based on correlation

# ETF Construction

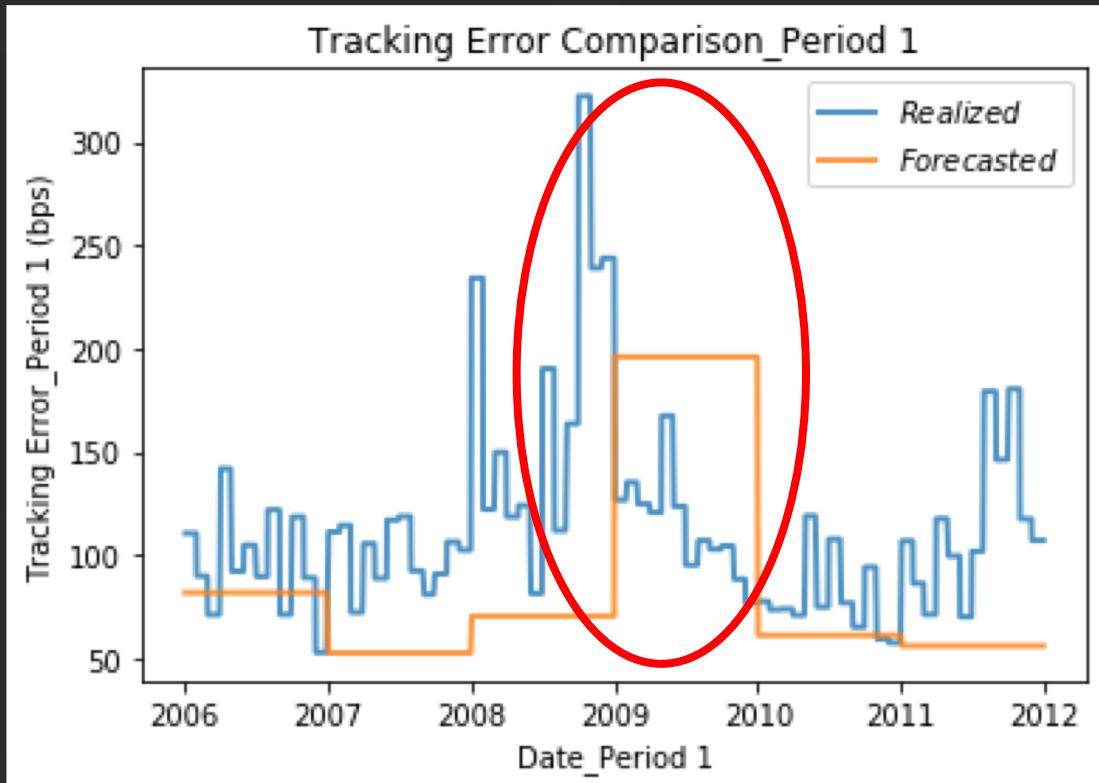
```
[[10.          0.56732957]
 [11.          0.57984436]
 [12.          0.35500748]
 [13.          0.4377201 ]
 [14.          0.30352503]]
```

- Choose the stocks with correlation coefficient > 0.5 into ETF
- Finalize ETF

Index	Type	Size	
0	str	1	INTC
1	str	1	VZ
2	str	1	T
3	str	1	IBM
4	str	1	MDT
5	str	1	TXN
6	str	1	QCOM
7	str	1	DE
8	str	1	ADSK
9	str	1	XLNX
10	str	1	AMD

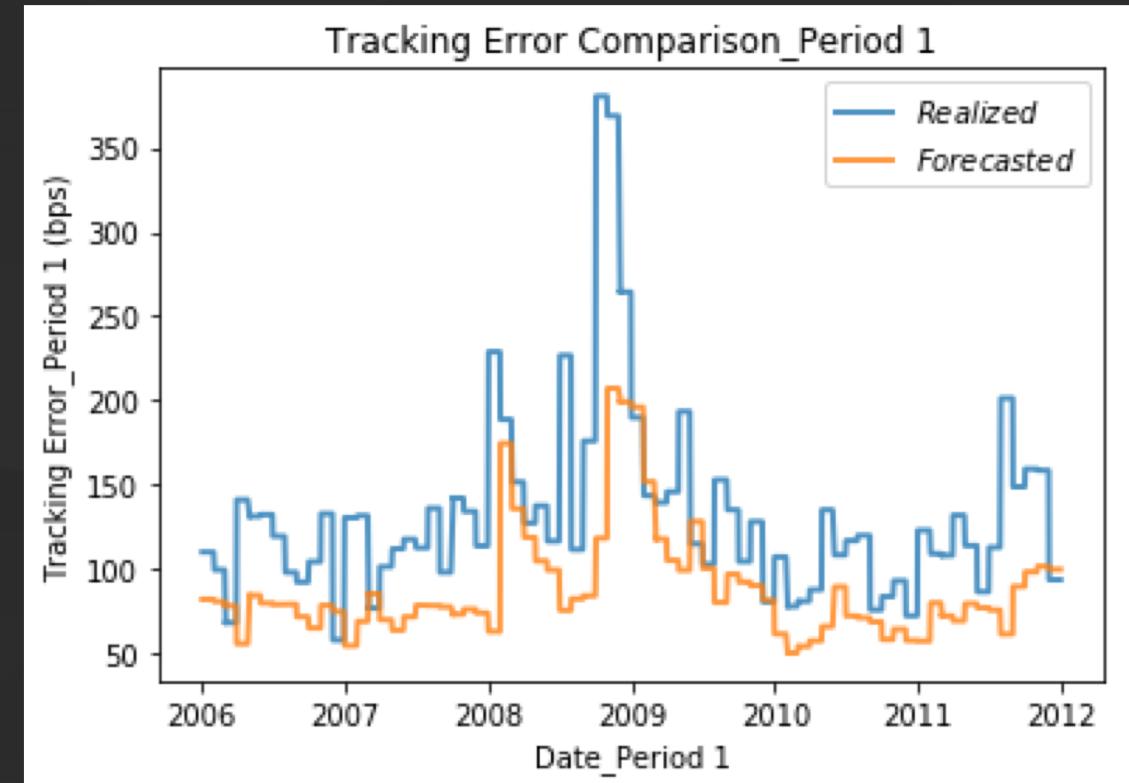
# Rolling Results Comparison

## Yearly Rolling Result



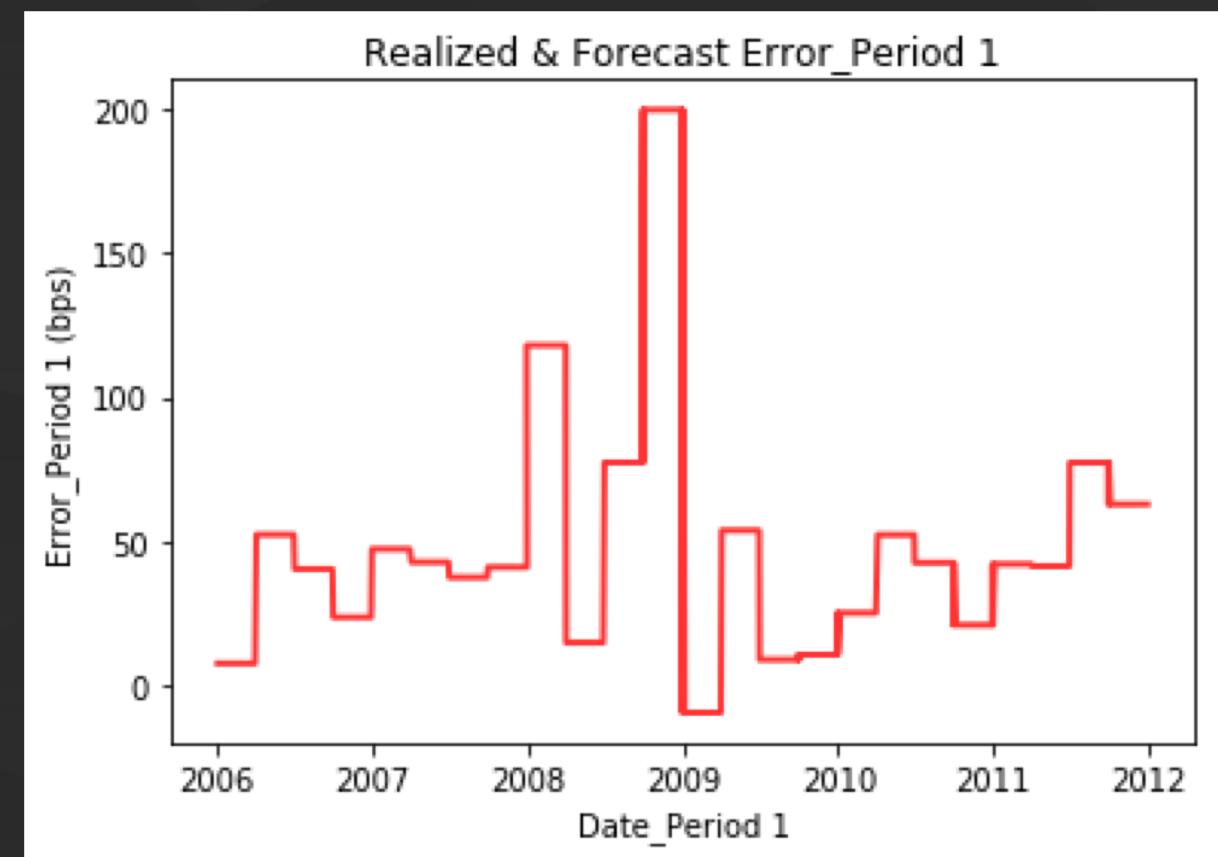
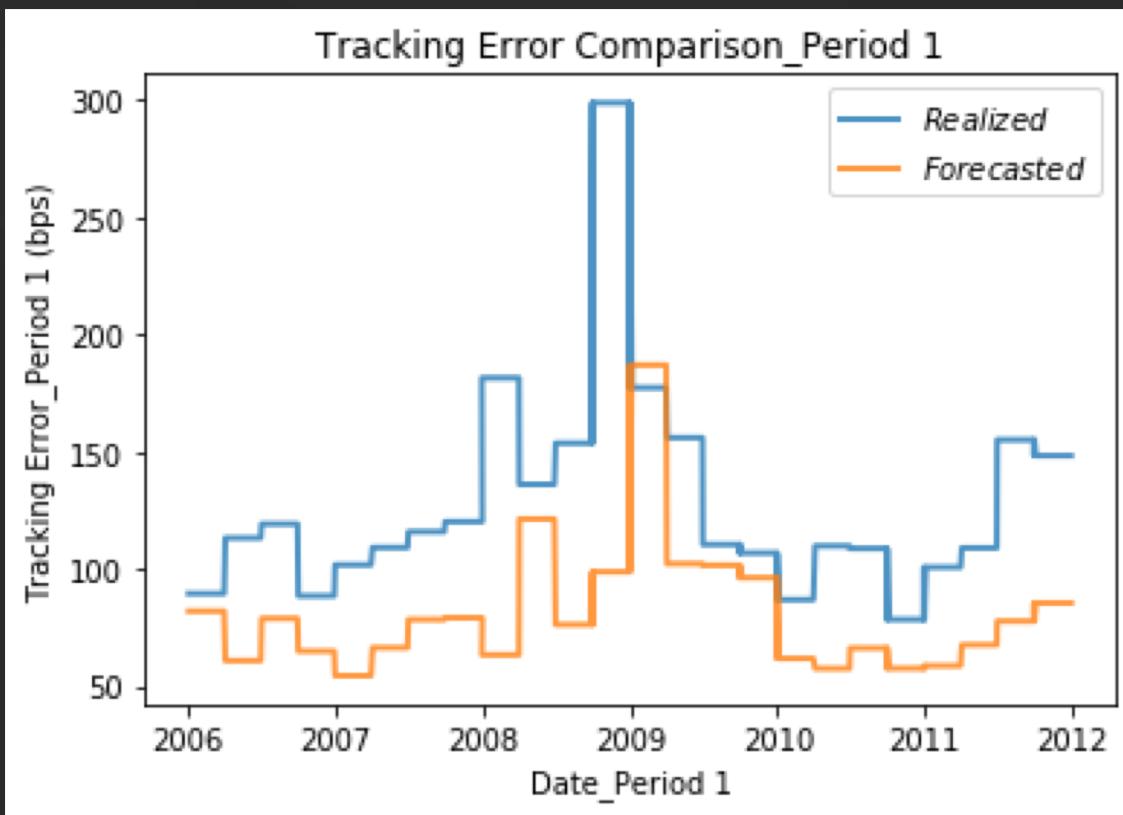
Longer Lag  
Lower Transaction Cost

## Monthly Rolling Result

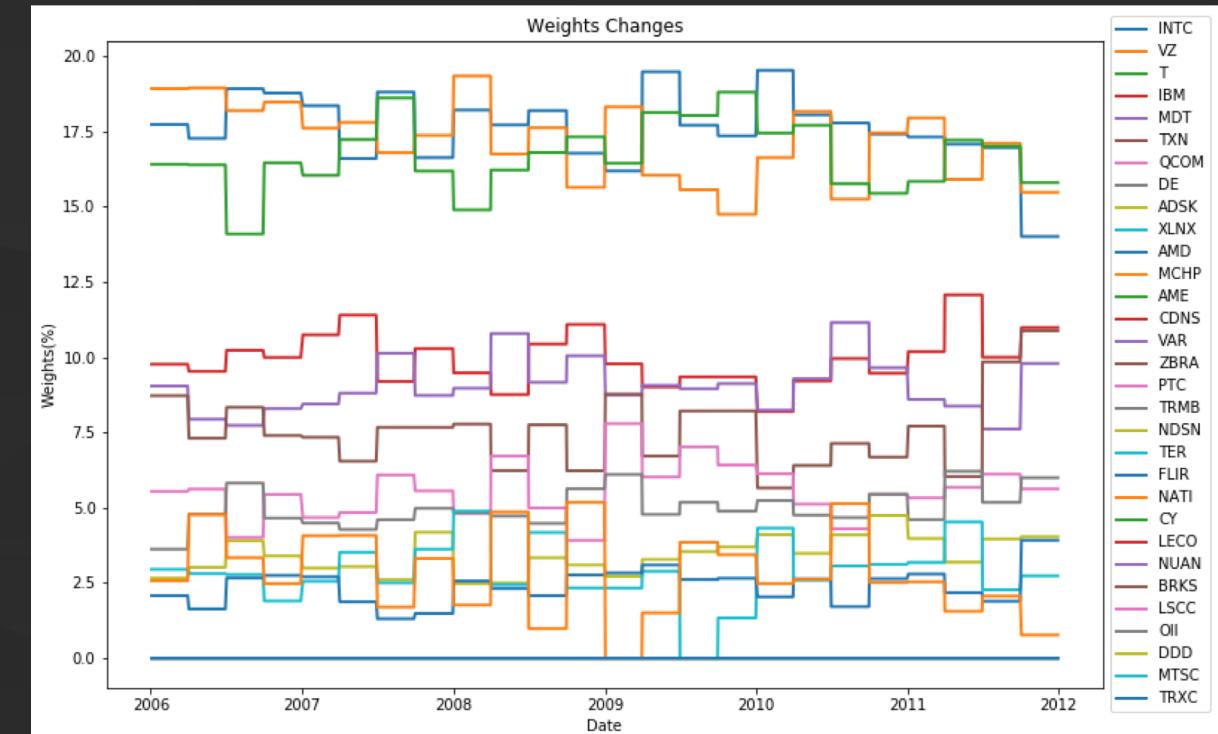
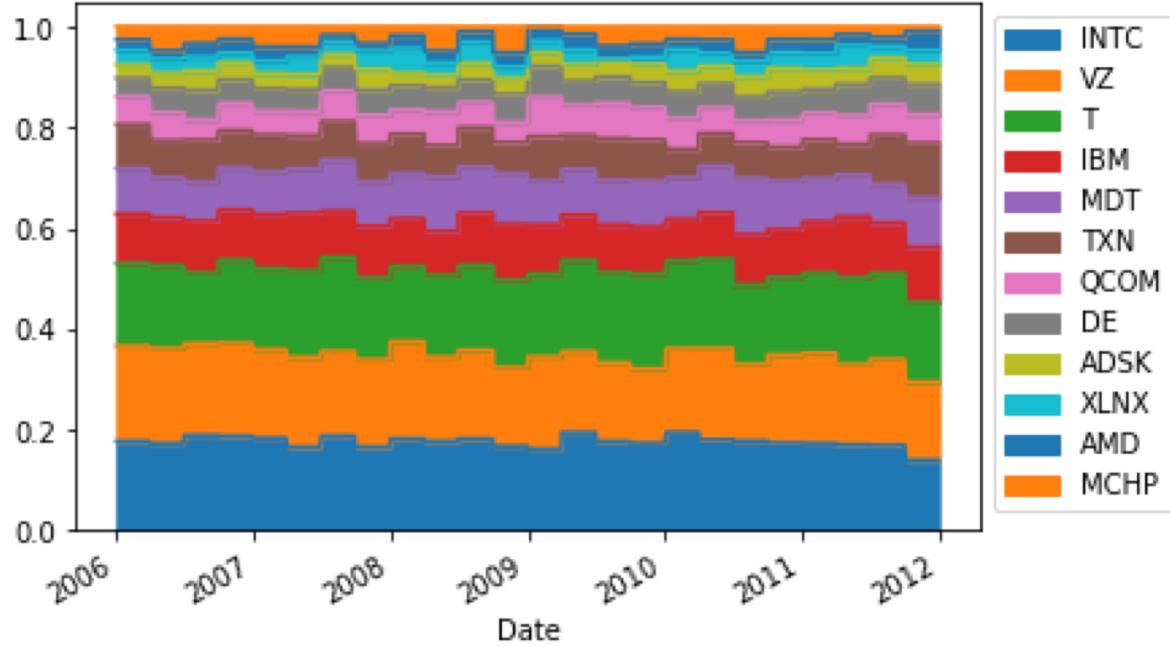


Shorter Lag  
Higher Transaction Cost

# Quarterly Rolling Results



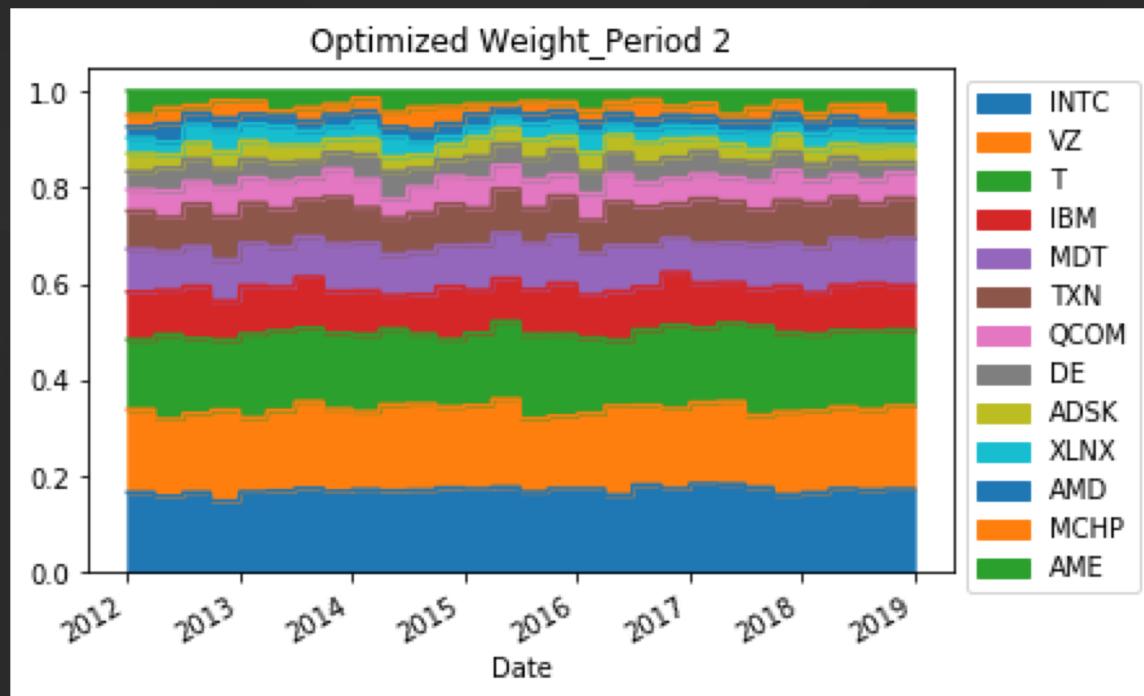
# Quarterly Rolling Weights



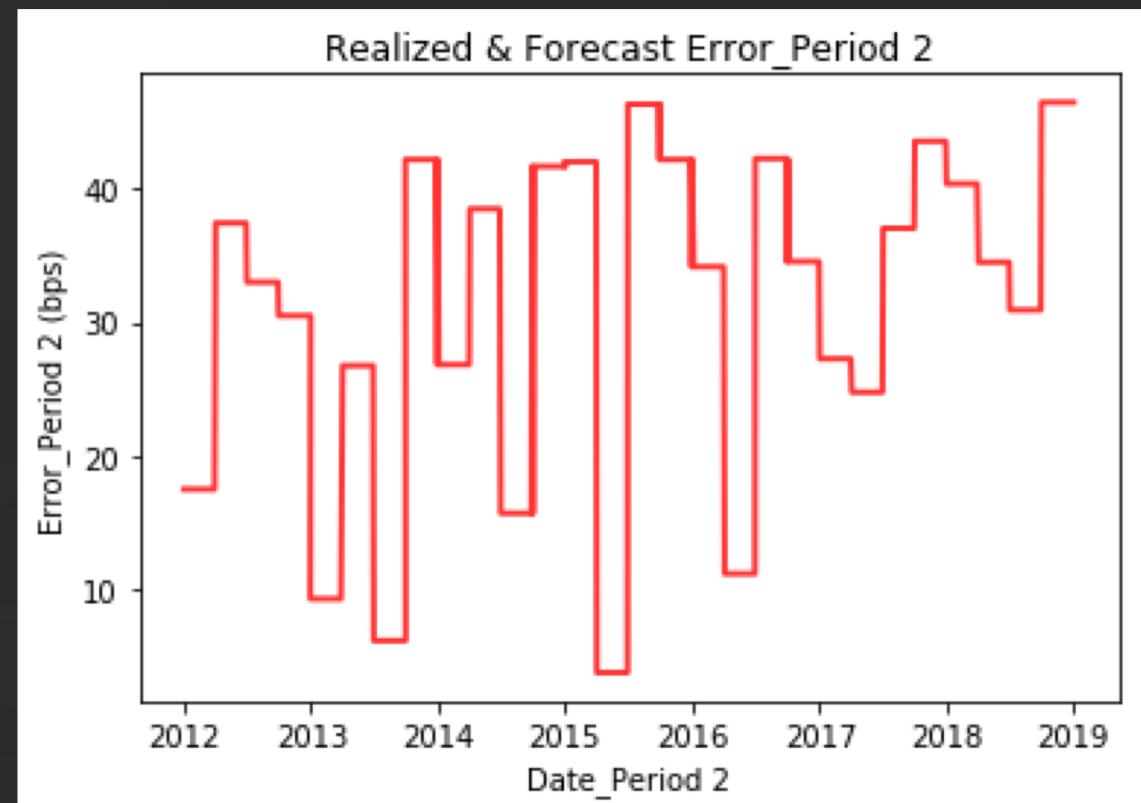
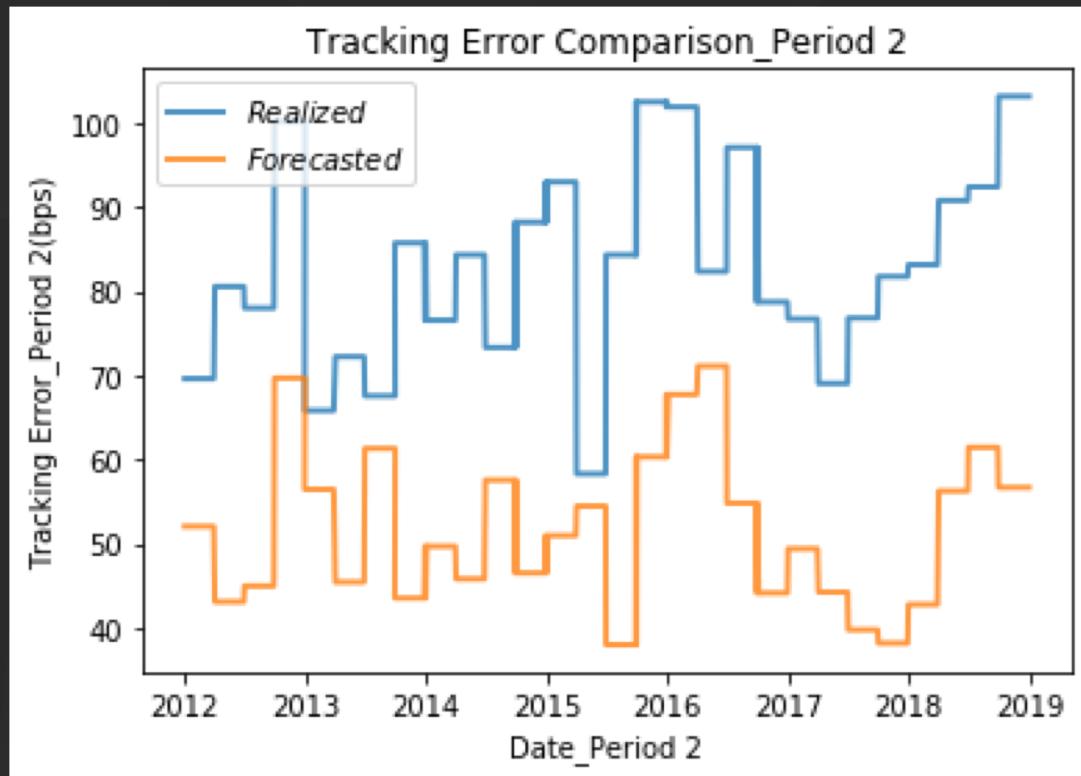
# Investment Strategy for Client

1. Select stocks in ETF based on market Cap ranking and asset return correlation to Index
2. Adjust stock weights in ETF quarterly

# **Investment Strategy For Period 2-**



# Investment Results For Period 2





## RISK PARITY STRATEGY

- ASSET SELECTION
- RESULTS COMPARISON
- CONDITIONAL FORECAST
- CONSTRUCTION INSIGHTS

# ASSET SELECTION

Index	BND	GLD	IWM	LQD	SHV	SHY	TIP	VNQ	VTV
BND	1	0.183041	-0.214613	0.556294	0.021592	0.522488	0.670659	-0.135518	-0.182668
GLD	0.183041	1	-0.00153286	0.0798968	0.0602764	0.197133	0.252907	0.0152329	0.00308486
IWM	-0.214613	-0.00153286	1	0.0643491	-0.192233	-0.356697	-0.215245	0.789087	0.909516
LQD	0.556294	0.0798968	0.0643491	1	-0.104923	0.193969	0.434992	0.0915097	0.0827603
SHV	0.021592	0.0602764	-0.192233	-0.104923	1	0.323394	0.127732	-0.14672	-0.21837
SHY	0.522488	0.197133	-0.356697	0.193969	0.323394	1	0.542446	-0.276468	-0.393905
TIP	0.670659	0.252907	-0.215245	0.434992	0.127732	0.542446	1	-0.143378	-0.211983
VNQ	-0.135518	0.0152329	0.789087	0.0915097	-0.14672	-0.276468	-0.143378	1	0.801772
VTV	-0.182668	0.00308486	0.909516	0.0827603	-0.21837	-0.393905	-0.211983	0.801772	1

Asset type: Equity, Bond, Gold, Real Estate

Sharpe Ratio: VTV(value equity)-0.359882, IWM(Russell 2000)-0.346258

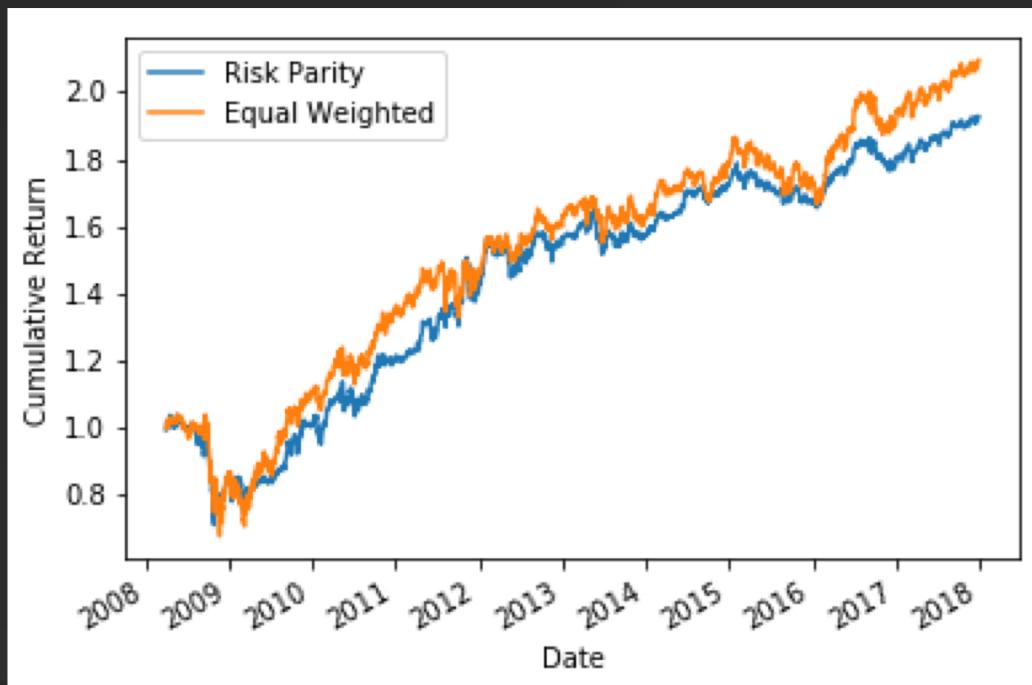
SHV(short T-bill)-1.14855, BND(bond market)-0.781256

GLD(gold)-0.214938

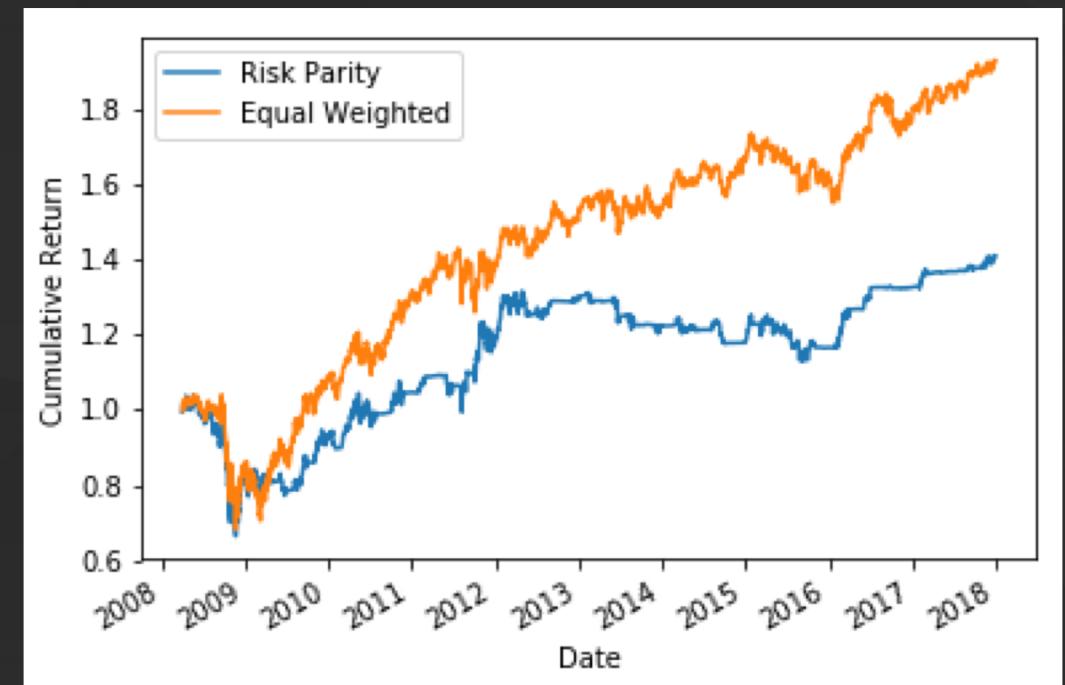
VNQ(real estate)-0.218863

# COMPARISON

Russell 2000

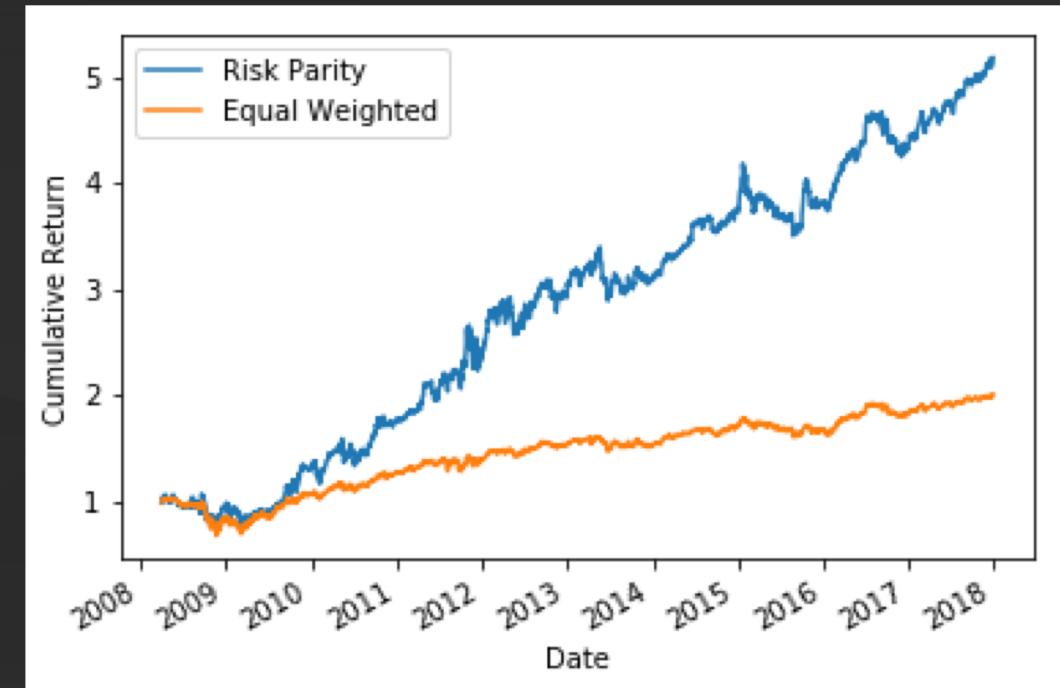


Russell 2000 & Short T-bill

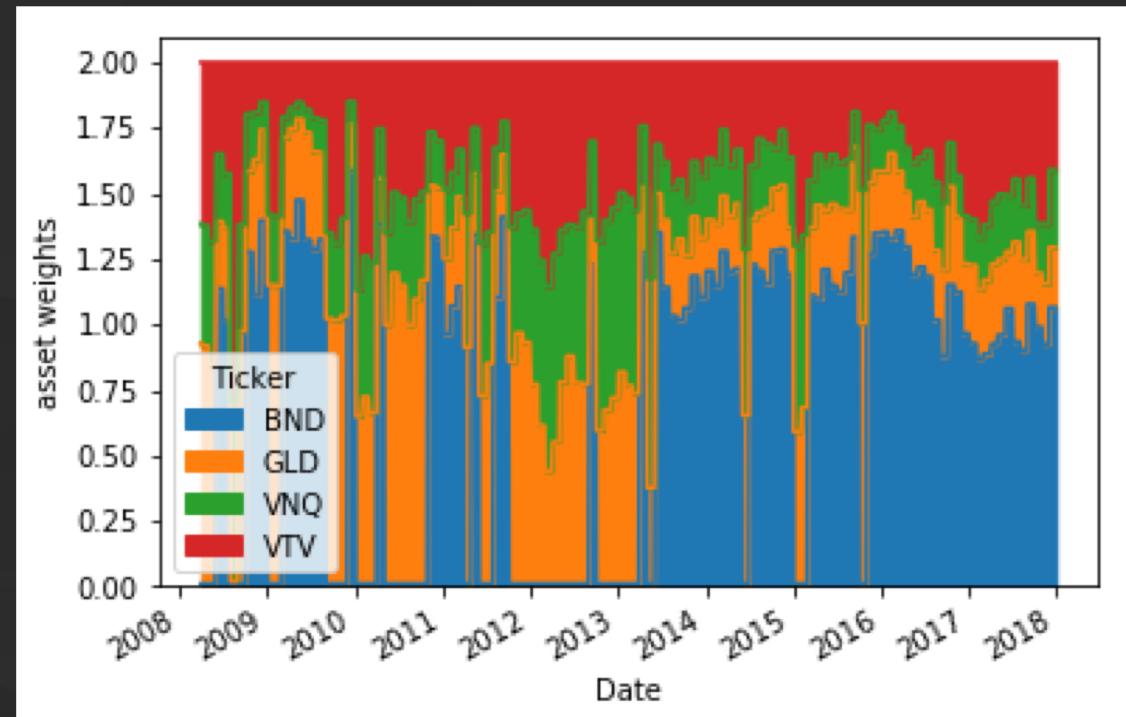
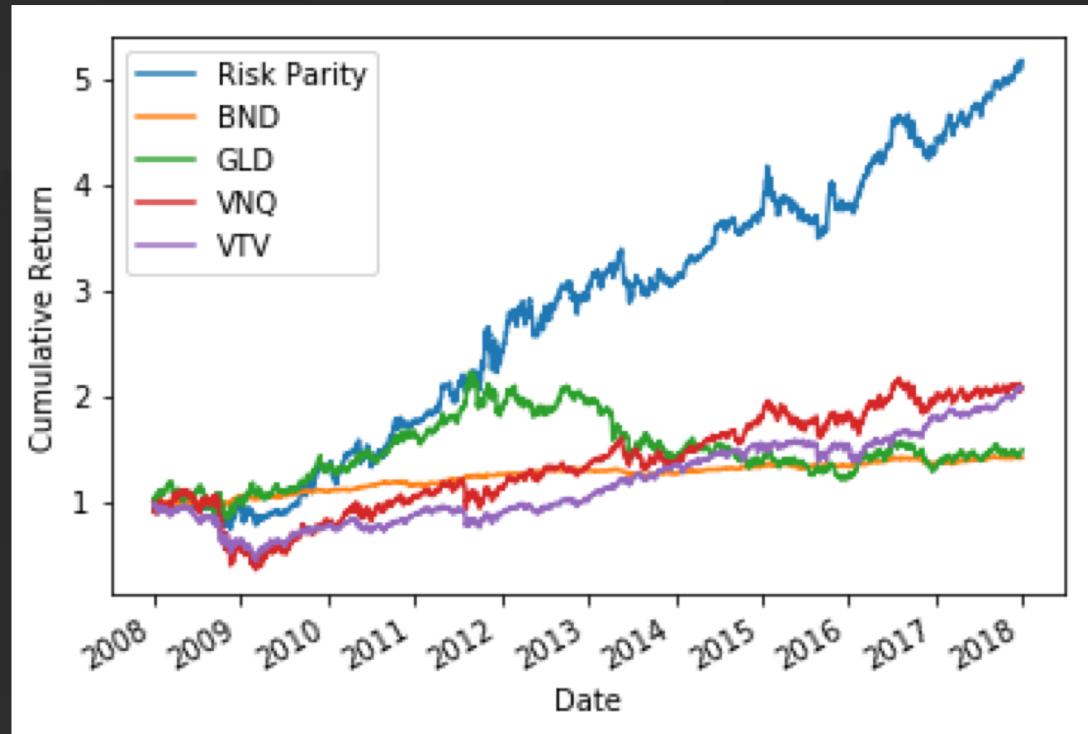


# FINAL PORTFOLIO

## Value Equity & Total Bond Market & Gold & Real Estate

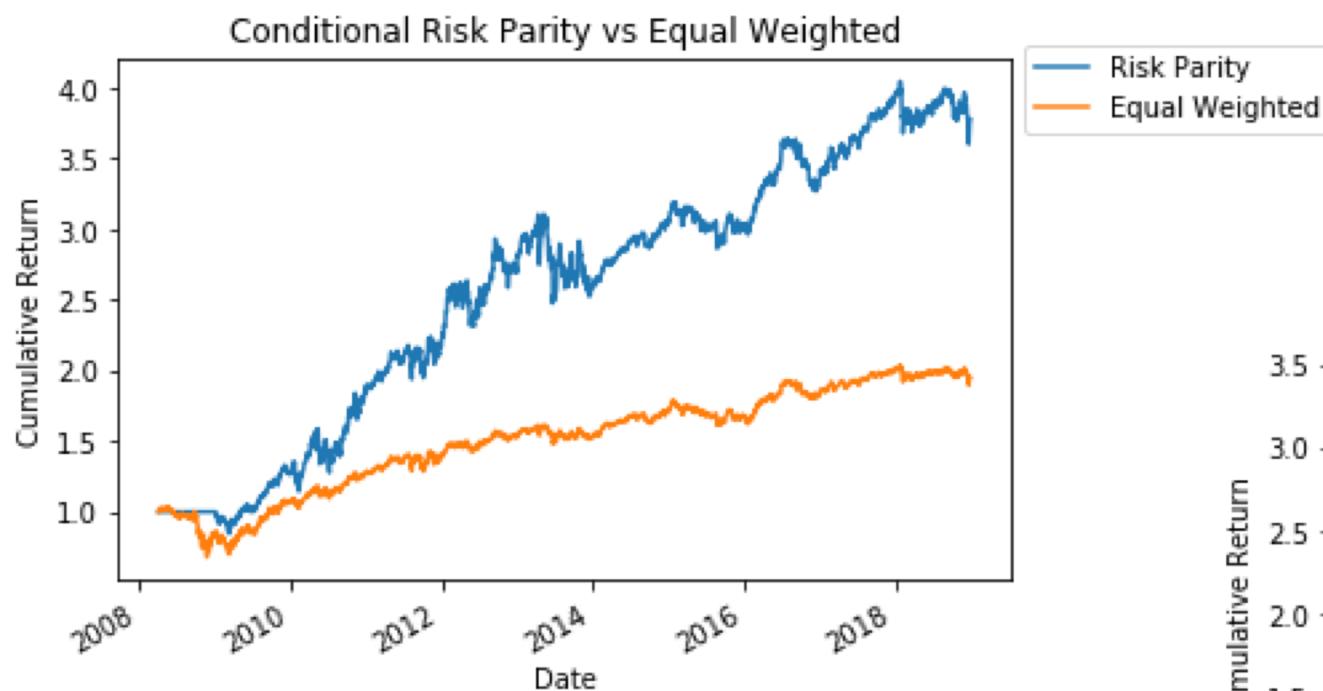


# FINAL PORTFOLIO

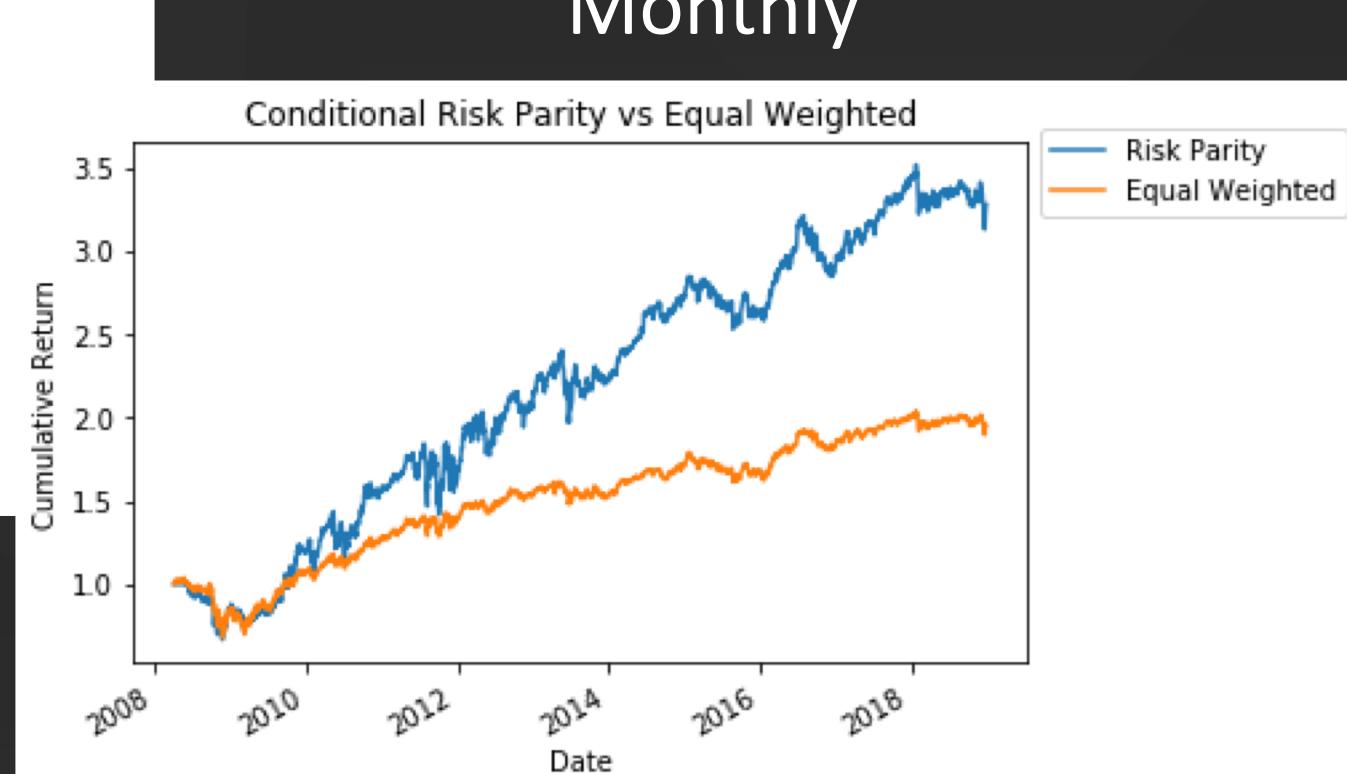


# Conditional Method

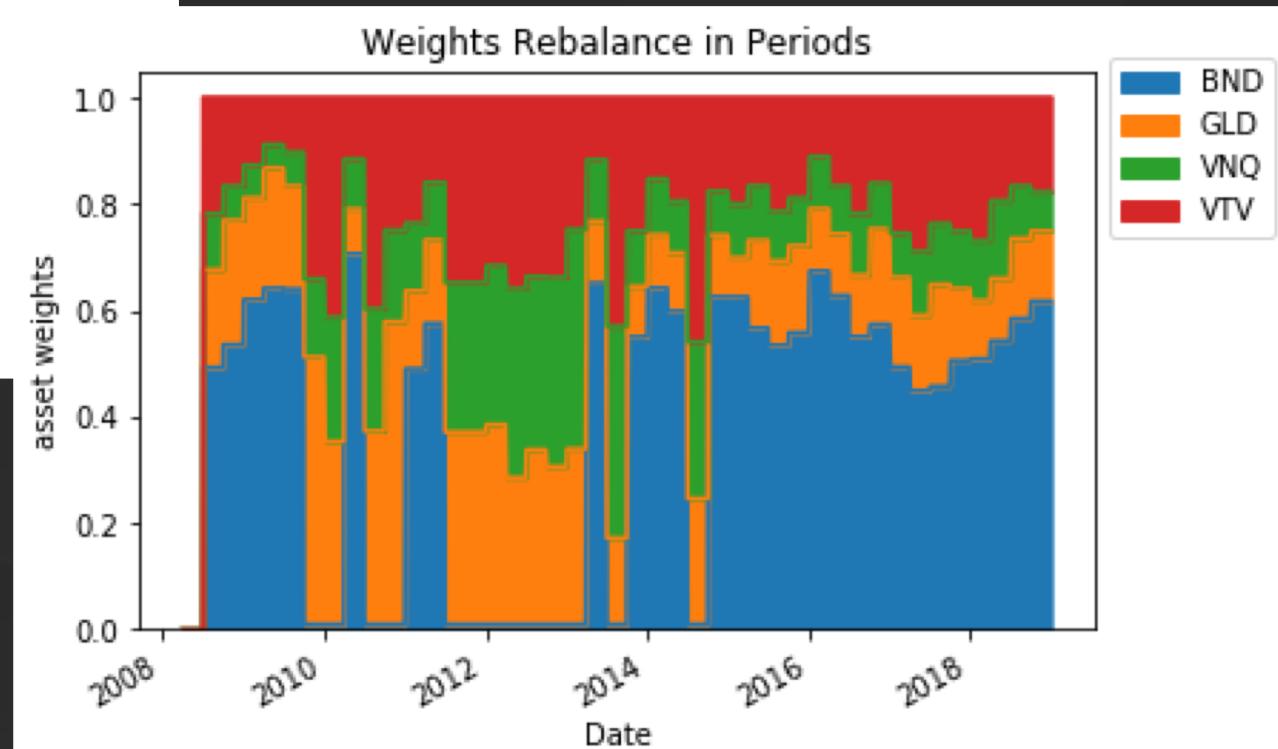
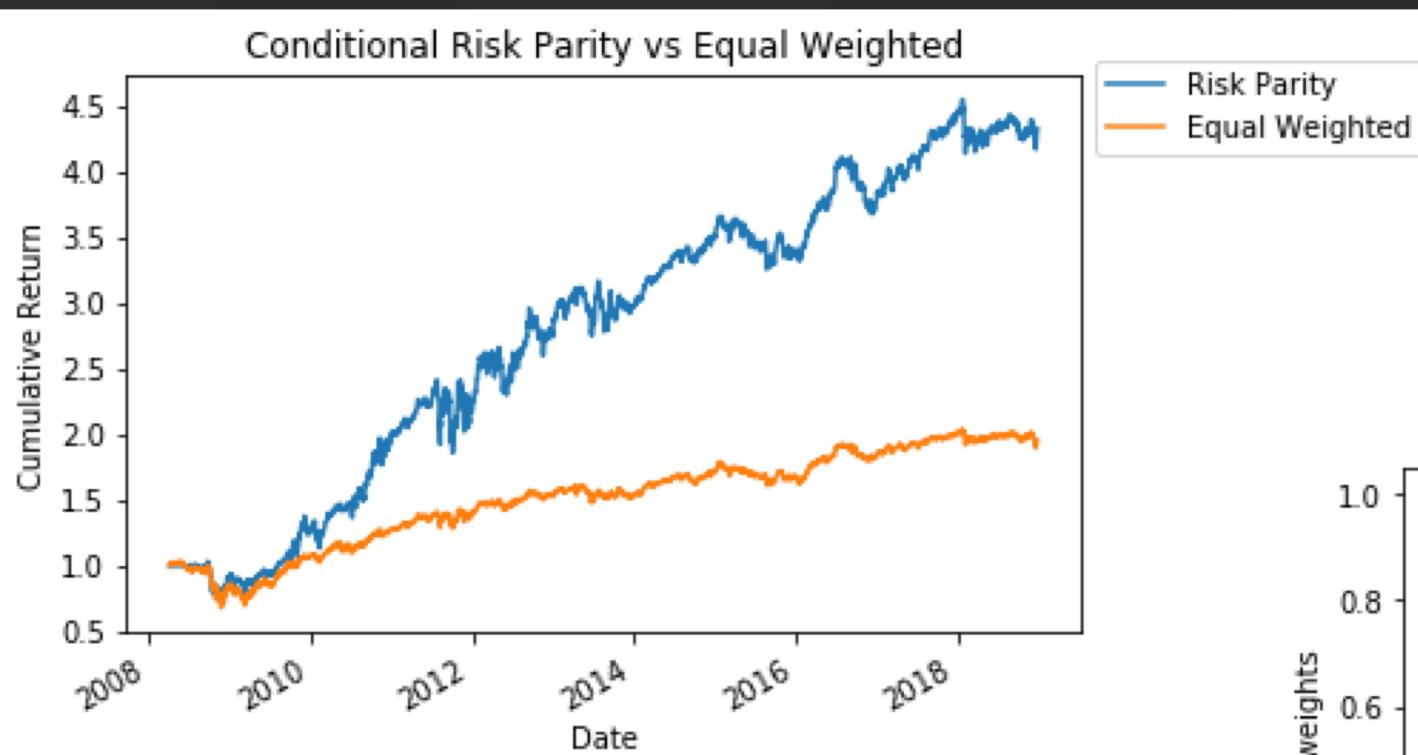
Yearly



Monthly



# Quarterly Rolling Results



# Sharpe Ratio

Index	Sharpe Ratio
risk_parity	[0.74637988]
equal_weight	[0.46692995]
VTV	0.306802
BND	0.729576
VNQ	0.188009
GLD	0.192065

## INSIGHTS FROM THE PROJECT

1

The rolling time frame is crucial for optimizing asset allocation and performance of risk parity strategy

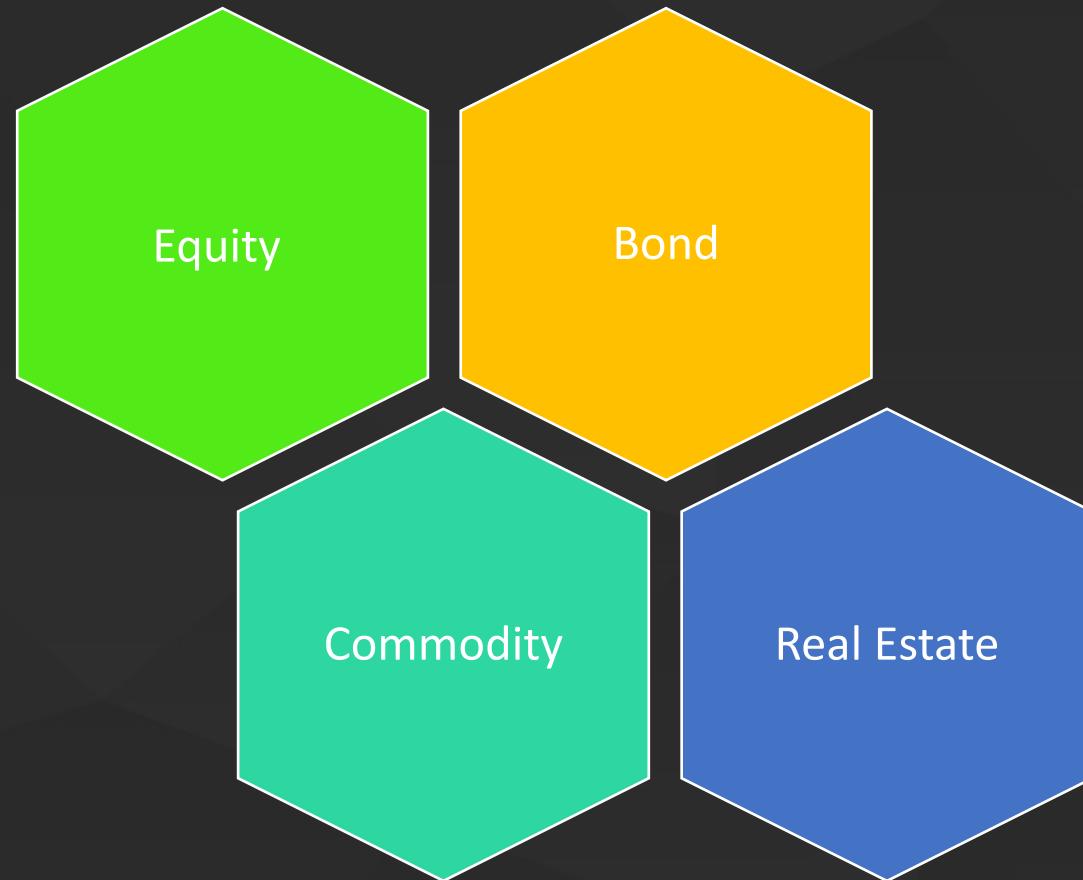
2

Sharpe Ratio is not the only factor we should consider to construct risk parity portfolio

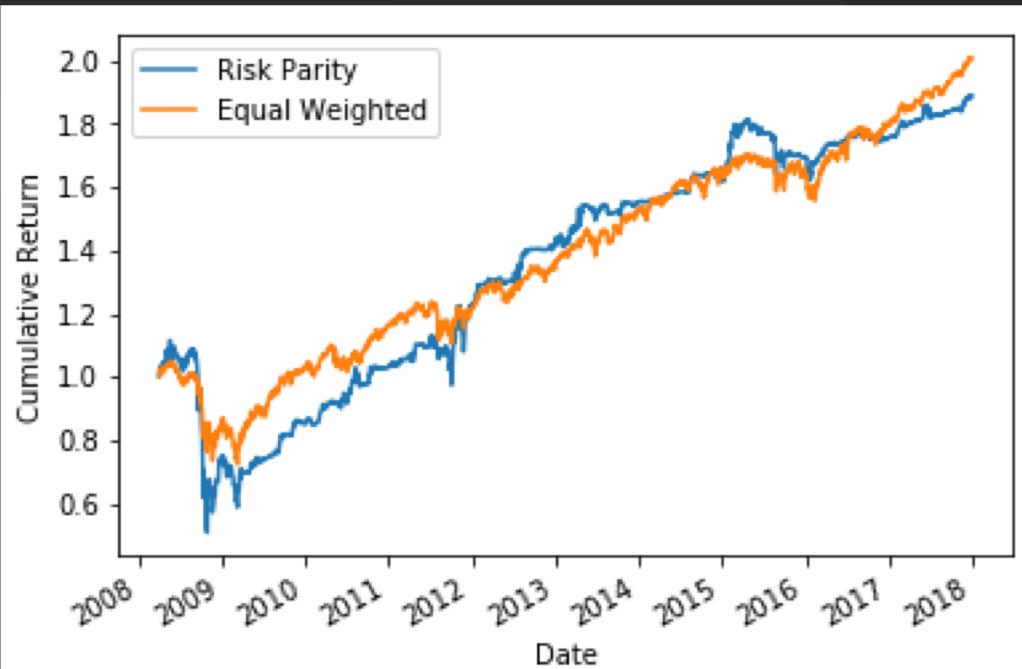
3

All weather strategy has a much more complicated structure

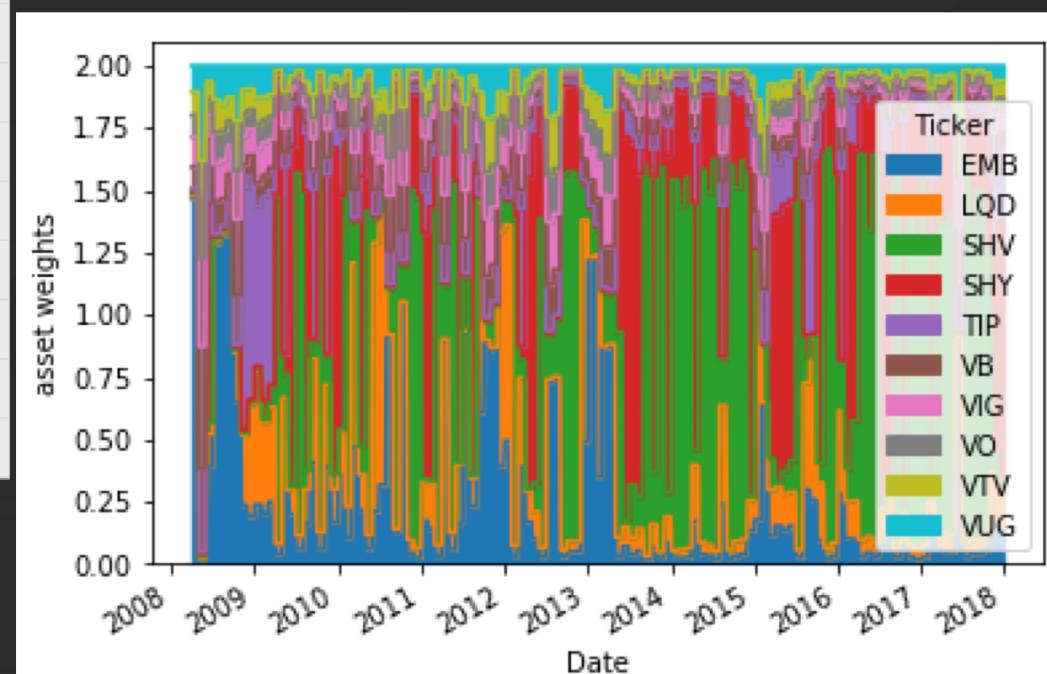
# APPENDIX



# APPENDIX



risk_parity	[0.4422684958...
LQD	0.661977
SHV	1.14855
SHY	0.969952
TIP	0.518722
EMB	0.585357
VIG	0.484425
VTI	0.359882
VUG	0.479576
VO	0.392727
VB	0.397228



*Thanks For Listening*